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few other naturalists, had brought this valuable material together. By far the greater part of this consisted of the fossil bones of birds, the mammals and fish having been described by Professor Cope in *The American Naturalist* and elsewhere.

The results of my share of the work have long since passed into the literature of the subject; and, as these are fully set forth in my academy memoir, they need not be especially reviewed in this place. It may only be noted that I announced, for the first time, the discovery of a long list of birds, based on the fossils referred to, the majority of which coincided with species and genera of existing forms, while a somewhat formidable array were extinct and new to science.

At the time my examination was made, the skeletons of existing birds at my command were entirely inadequate for the purposes of making reliable diagnoses and references. During the past twenty years, however, such material has been vastly increased in our museums, especially in the U. S. National Museum, and for the use of this in the present connection I am much indebted.

Several years ago, what may be collectively designated as the Cope collection from the aforesaid region was purchased by the American Museum of Natural History in New York City for its paleontological department; and only a few months ago Dr. W. D. Matthews, the curator of that department, shipped me to Washington the entire collection for the purpose of a complete revision. This task is now practically completed, and the object of the present article is simply to publish an advance abstract as an announcement of the additional birds of the region in question, the fossil remains of which I have found to exist in the aforesaid collection, and a small collection from the same localities (Silver and Fossil lakes), which belongs to the U. S. National Museum. The new species will be fully described in the forthcoming contribution on the subject, accompanying which will be found upwards of 600 figures illustrating the entire avifauna of the Pleistocene of Oregon, in so far as their fossil remains are concerned.

The list is as follows, each species in it, with one exception, being announced for the first time:

1. *Colymbus parvus* (extinct).
2. *Podilymbus magnus* (extinct).
3. *Centrocerus urophasianus*.
4. *Mergus americanus*?
5. *Mergus serrator*.
6. *Mergus* sp.?
7. *Marila americana*?
8. *Marila valisineria*.
9. *Marila marila*.
10. *Marila affinis*?
11. *Marila collaris*?
12. *Charitonetta albeola*.
13. *Histrionicus histrionicus*.
14. *Polysticta stelleri*.
15. *Erismatura jamaicensis*.
16. *Branta c. hutchinsi*?
17. *Branta c. minima*?
18. *Branta bernicla*.
19. *Olor columbianus*.
20. *Olor buccinator*.
21. *Olor matthewi* (extinct).
22. *Ardea herodias*.
23. *Botaurus lentiginosus*.
24. *Aquila chrysaetos*.
25. *Haliaeetus leucocephalus*.

Erismatura jamaicensis has been previously announced by Mr. L. H. Miller in the *Bulletin* of the Academy of Natural Sciences of California. The three new extinct birds found, and the descriptions of them, will appear when the memoir is published.

R. W. SHUFELDT

November 18, 1912

PROCEEDINGS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA

THE seventh annual meeting of the Entomological Society of America was held at Cleveland, Ohio, December 31 and January 1, in the auditorium of the Normal School. The meetings were all well attended and enthusiastic. The following papers were presented:

C. BETTEN, Lake Forest University: *An Interesting Feature in the Venation of Helicopsyche, the Molannidae and the Leptoceridae.*

In the trichopterous genus *Helicopsyche* radius of the fore wing is found in primitive condition, i. e., R_1 is simple and the sector is dichotomously branched. The homology is but slightly obscured

by the fact that the cross vein $r-m$ is in direct line with the distal part of R_5 , making the latter appear to arise from M . It is suggested that the same interpretation should be made in the case of the Molannidæ and the Leptoceridæ. In these families R_5 has more definitely assumed relations with M , with which vein its distal part may be wholly fused. This interpretation is based not only on comparison with *Helicopsyche*, but also upon the fact that it leaves the "corneous point" within cell R_4 , where it occurs in all other families if it occurs at all. The venation of the hind wings of these forms is similarly interpreted.

LUCY W. SMITH, Mt. Holyoke College: *Mating and Egg-laying Habits of Perla immarginata*.

In introduction the paper gives a general description of the method of keeping adult stoneflies under observation in captivity, and of handling their eggs. This is followed by a detailed account of the genital armature, copulation and egg-laying habits of a single species, *Perla immarginata*.

ALVAH PETERSON, University of Illinois: *Head and Mouth Parts of Cephalothrips yuccæ*.

A preliminary report on the asymmetry of the mouth-parts of Thysanoptera. A detailed description of the anatomy of the mouth-parts and head capsule of *Cephalothrips yuccæ*, a species belonging to the suborder Tubulifera, was given. Numerous details and parts heretofore undescribed as to mandibles, hypopharynx, epipharynx, arms of tentorium, etc., were shown. Similar observations were made on *Anthothrips verbasci* in order to verify results found in *Cephalothrips yuccæ*.

Comparing the work done by H. Garman on *Limothrips cerealium*, a species of Terebrantia, with the work done by Muir and Kershaw on a species of Tubulifera, a difference in interpretation exists as to whether the asymmetrical parts are mandibles or maxillæ. Muir and Kershaw interpret the asymmetrical parts as maxillæ. Observations made by the writer on two species of Tubulifera verifies their position in general. The writer expects to continue his observations on species of the suborder of Terebrantia to determine if possible whether the interpretation of H. Garman is correct or not.

J. E. WODSEDALEK, University of Wisconsin: *Life History and Habits of Trogoderma tarsale*, a Museum Pest. Read by title.

LEONARD HASEMAN, University of Missouri: *Life Cycle and Development of the Tarnished Plant Bug, Lygus pratensis Linn.* Presented by the secretary.

Owing to the very serious injury to peach and pear in the early spring which seemed to be due to the work of the tarnished plant-bug, the writer has undertaken a careful study of the life cycle, habits and development of this insect. The work has been carried through the late summer and fall months and will be continued throughout the following spring and summer.

In this work it has been found that the tarnished plant-bug breeds largely upon various flowering weeds, such as wild asters, daisies and mare's tail (*Erigeron canadensis*). The tarnished plant-bug deposits its eggs in the blossoms of the host plant and not in the tissue of the leaves or stems. These eggs hatch in from five to seven days and the insect passes through five distinct nymphal stages in its development in the place of four, as other writers have maintained. The insect remains in each nymphal stage for about the same length of time and completes its growth in from thirty to thirty-five days.

VICTOR E. SHELFORD, University of Chicago: *The Ontogeny of Elytral Pigmentation in Cicindela*.

The pigment develops in the form of a faint pattern, somewhat variable, but with certain lighter areas occurring in the same general position in several species. These lighter areas lie between the tracheæ and in certain transverse bands; their position corresponds to those of certain white markings of Ethiopian and Oriental species.

N. L. PARTRIDGE, University of Illinois: *The Tracheation of the Pupal Wings of some Saturnians*.

A method of preparing permanent mounts of lepidopterous pupal wings was described. The pupal wings were removed in the customary manner and the specimens secured, floated upon clean water to straighten the wings and remove any dirt which might adhere to them. Then they were placed on a clean, untreated glass slide, smoothed and allowed to dry, without further treatment. The result was a transparent mount showing all the tracheoles as well as the tracheæ. Some of these mounts were used as lantern slides, giving clear images on the screen.

It was shown that a greater amount of variation was found in the pupal wings than in the adult wings. The homologies between the tracheæ and veins, of the specimens shown, was indicated.

L. B. WALTON, Kenyon College: *Studies on the Mouth-parts of Rhyarobia maderiæ (Blattidæ)*

with a consideration of the Homologies existing between the Appendages of the Hexapoda.

The question as to the homologies existing among the paired appendages of the Hexapoda has received attention from various investigators, and in particular from Hansen, Heymons, Börner, Verhoeff and Escherig, none of whom, however, have progressed far toward a satisfactory solution of the problem. In general it has been accepted that the stipes and mentum corresponded to the thoracic and abdominal coxæ while the maxillary and labial palpi were equivalent to the trochanter, femur, etc., of the functional leg.

Studies on *Rhyparobia maderæ*, the "giant cockroach" from Panama, particularly of 10 mm. and 12 mm. embryos, as well as other investigations in connection with the appendages of the Thysanura, make it evident that the typical appendage (mouth parts, thoracic, abdominal, caudal) of the Hexapoda consists of seven definite areas best represented by the maxillæ with the galea, lacina, ectostipe,¹ endostipe, ectocardo, endocardo and palpus. Furthermore, the palpus should be homologized with the stylus of the thoracic and abdominal coxæ and not with the functional leg, inasmuch as both palpus and stylus are appendages of homodynamous areas (ectostipe, ectomentum, meron) while the leg is an appendage of the area (endocoxa) corresponding to the endostipes.

The facts noted suggest the origin of the biramous appendage of the Hexapoda directly from the parapodium of the Polychæta, the notopodium and neuropodium arising in connection with the dorsal and ventral bundles of setæ and corresponding to the outer (ectal) and inner (endal) groups of sclerites as outlined above. It would thus appear that the Arthropoda are a polyphyletic group, and that the relationship between the appendages of the Hexapoda and Crustacea is a more remote one than generally accepted in connection with the studies of Hansen and Börner.

The historical development of the problem as well as the presentation of the facts which would seem to establish the views here advanced, will appear in the completed paper, of which this is a partial summary.

JAMES ZETEK, Sanitary Commission Canal Zone:

¹The prefixes "ecto" and "endo" have been utilized in an attempt to establish a better nomenclature, while minor changes have been made in the terminology of older parts, *e. g.*, "ectostipes" is a more cumbersome term than "ectostipe."

Determining the Flight of Mosquitoes. Read by title.

WILLIAM A. RILEY, Cornell University: *Some Sources of Laboratory Material for Work on the Relation of Insects to Disease.*

The demand for at least elementary courses on the relation of insects to disease brings up the question as to available laboratory material. There is comparatively little difficulty in obtaining the parasitic mites, ticks, lice, house-flies, mosquitoes and fleas in their various stages, but it is usually assumed that most of the pathogenic Protozoa are tropical species and that nothing can be substituted for them in laboratory work. As a matter of fact, a number of insect-borne Protozoa and worms occur in this country and, together with other blood parasites whose life-history is less better known, are available for laboratory work. The species discussed were *Trypanosoma lewisi*, a widely distributed parasite of brown rats; *Trypanosoma rotatorium* from the frog; the related *Crithidia* from the "sheep tick"; *Herpetomonas* from the house-fly; *Monocystis* from the seminal vesicles of the earthworm as introductory to the study of the Hæmosporidia; *Lankesterella ranarum*, *Hæmogregarina* sp.; *Proteosoma*, *Halteridium*, *Babesia hilaria* in the blood of the crow and English sparrow, and *Dipylidium caninum*, the double-spored tapeworm of dogs, cats and man.

Y. H. TSOU and S. B. TRACKER, University of Illinois: *The Homology of the Body Setæ of Lepidopterous Larvæ.*

This paper consisted (1) of a statement of the difficulties involved in homologizing the body setæ of these larvæ, (2) of a consideration of the serial homology of the setæ of the different segments and (3) of the specific homology in the larger groups. Greek letters were employed to designate the setæ in order to obviate the confusion which has arisen from the use of numbers in different ways by different authors. The prothorax of *Hepialus* was shown to represent the primitive arrangement of setæ and was used as a type for determining the homology of the setæ on the different segments. The authors had studied many species and gave figures of four: *Hepialus lectus* and *H. humuli* of the Jugatæ, *Pseudanophora arcanella* of the Tineidæ and *Mamestra picta* of the Noctuidæ. Each of these was compared with the type, segment for segment. This is the first time the setæ of the prothorax have been homologized with those of the other segments.

ANNA H. MORGAN, Mt. Holyoke College: *Eggs and Egg-laying of May-flies.*

This study of May-fly eggs was made to determine the relative fecundity of different species. This led to the study of a series of elaborate sculpturings found upon the chorion. In several species the chorion bears long thread-like extensions which terminate in viscid spheres or disks. These seem to help buoy up the eggs. Threads two and three inches long were found. In nature these threads are probably entangled in sticks and vegetation and this prevents the eggs from being covered by silt. In the ovaries of half-grown nymphs these structures are well defined and are of aid in connecting up the life histories where rearing is impossible.

HERBERT OSBORN, Ohio State University: *Notes on Cicadidae with Especial Reference to the Ohio Species.*

Cicadas constitute a conspicuous element in insect fauna and their relation to varied forest conditions is discussed especially for the species occurring in Ohio. The origin and function of the tympanal organs present problems for study and the suggestion is made that this structure is primarily a secondary sexual character functioning in sexual excitation and only incidentally a sound-producing organ.

FRANK E. LUTZ, American Museum of Natural History: *On the Biology of Drosophila ampelophila.*

This insect is remarkably useful in laboratory work, since it can be kept going throughout the year on bananas as food and its short life-cycle (about ten days to two weeks) enables one to get a large number of generations. Sexual difference characterizes the insect. Not only do the sexes differ in adult color and structure, but they differ in the duration of the immature stages, in their reactions to light and the age at death.

E. P. FELT, State Entomologist, New York: *Observations on the Biology of a Blow-fly and a Flesh-fly.*

A study of *Phormia regina* Meign. and *Sarcophaga georgina* Wied. was undertaken primarily for the purpose of obtaining data which could be used as a basis for estimating the period a human body had laid exposed to the elements in mid-summer. Our knowledge of these two species is summarized and original data are given on the habits and duration of the various stages under known climatic conditions. The egg of *Phormia* and the three larval stages and puparium of both

species are described and a bibliography of each appended.

EDITH M. PATCH and WILLIAM C. WOODS, Maine Agricultural Experiment Station: *A Study in Antennal Variation.* Read by title.

ALEX. D. MACGILLIVRAY, University of Illinois: *Propharynx and Hypopharynx.*

The pharynx after entering the occipital foramen makes a distinct bend toward the mouth. In the region of the clypeus it divides transversely, one half passes to the clypeo-labral side, the other half to the labial side of the mouth, while folds extend along each lateral margin and unite with the mandibles and maxillæ. The name of propharynx is proposed for the portion lying adjacent to the clypeo-labral part of the mouth and hypopharynx is used for the portion lining the labial portion. The propharynx consists of three parts: frontal lobe, epipharynx and fulcrum. The frontal lobe is usually wanting in sucking insects, the epipharynx is modified into a tongue or piercing organ and the fulcrum into a cuticular supporting plate. In the muscids the epipharynx and fulcrum are located outside of the mouth, the proximal end of the fulcrum is attached to the distal margin of the labrum. The hypopharynx also consists of three parts: lingua, superlingua and pharangial sclerites.

T. L. WASHBURN, State Entomologist, Minnesota: *A Few Experiments in Photographing Living Insects.*

THOMAS J. HEADLEE, New Jersey Agricultural Experiment Station: *Some Facts Regarding the Influence of Temperature and Moisture Changes on the Rate of Insect Metabolism.*

While connected with the Kansas State Experiment Station at Manhattan, the writer found by subjection of different groups of the southern grain louse (*Toxoptera graminum* Rodani) to various constant temperatures under constant atmospheric moisture conditions and other groups to various constant percentages of relative humidity under constant temperature conditions: (1) that the rate of increase in metabolism for each 10° F. increase in temperature, starting at 50° F., decreases as the optimum temperature is approached, and that while the metabolism of degeneration becomes more rapid after the optimum is passed the rate of growth is retarded; (2) that a variation of from 60 to 62 per cent. in atmospheric moisture does not affect the rate of metabolism when the creatures have an abundant supply of succulent food.

Similar tests of the effect of temperature on the rate of metabolism in *Lysiphlebus tritici* Ashm. and of the effect of temperature and moisture on the rate of metabolism of the chinch bug (*Blissus leucopterus* Say) infected and uninfected by the chinch-bug fungus (*Sporotrichum globuliferum* Speg.) gave similar results.

J. T. ABBOTT, Washington University: *The Strigil in Corixidae and its Probable Function*. Read by title.

EDNA MOSHER, University of Illinois: *The Anatomy of some Lepidopterous Pupæ*. (Presented by Mr. Alvah Peterson.)

Figures of pupæ of three species were shown; also figures of the pupæ with the cases dissected away so as to show the parts underneath. Considerable difficulty has been encountered in homologizing the pupal structures from the external appearance, particularly in the case of the fixed parts of the head and the appendages of the head and thorax. The leg cases were shown to be a frequent source of error. Instead of showing externally only the cases for the tibiæ and tarsi, as Scudder claims is the case in the butterflies, certain forms show the femur cases and either the whole or part of the coxal cases in certain pairs of legs. What Packard calls the paraclypeal pieces, were shown in these forms to contain functionless mandibles which had their distal margins toothed in the case of *Lymantria*.

This detailed anatomical study is to be made the basis for a phylogenetic and taxonomic arrangement of the Lepidoptera based on an examination of the characters of the pupæ.

CHARLES K. BRAIN, Ohio State University: *Some Anatomical Studies of Stomoxys calcitrans* Lin. (Introduced by Professor Herbert Osborn.)

The external mouth-parts and digestive system of both sexes of this species are identical in structure, and both sexes suck blood. The external mouth-parts consist of maxillary palpi and proboscis; the latter consisting of labrum, hypopharynx and the labium.

The digestive system consists of proboscis, pharynx, œsophagus, proventriculus, intestine, rectum and the appendages, viz., salivary glands, sucking stomach and Malpighian tubes. The two Malpighian tubules of the left Malpighian tube have much thickened ends, which lie dorsally. Those of the right side have no such thickened ends. The male reproductive organs consist of a pair of spherical testes which appear orange-colored in dissections, owing to their pigmented

sacs, their ducts leading into the common vesicula seminalis, the ejaculatory duct and the penis.

The female reproductive organs consist of the ovaries, oviducts, uterus and ovipositor, with the appendages, the uterine glands and the receptacula seminis.

S. W. BILSING, Ohio State University: *Observations on the Food of Spiders*. (Introduced by Professor Herbert Osborn.)

Spiders are known to feed upon insects, but exact records of kind and quantity of food for particular species are very meager. Extended observations and records were made during the summer and fall of 1912 and data from some of these are presented. As an example of the records given, grasshoppers constituted 39 per cent. of the food of *Miranda aurantia*, 59 per cent. of the food of *Agalena naevia* and 22 per cent. of the food of *Aranea trifolium* during the period under observation.

HERBERT OSBORN, Ohio State University: *Observations on Insects of a Lake Beach*.

The insect fauna of the Cedar Point Beach of Lake Erie is discussed with reference to its derivation and adaptation for the conditions presented. The insect drift, the migrant and the resident members of the association are separated and records of species in each group given.

C. H. TYLER-TOWNSEND, Government Entomologist of Peru: *The Species-Status and the Species-Concept*. Read by title.

C. H. TYLER-TOWNSEND, Government Entomologist, Peru: *A New Application of Taxonomic Principles*. Read by title.

The annual public address of the society was given on Wednesday evening, January 1 in the auditorium of the Normal School by:

DR. PHILIP P. CALVERT, University of Pennsylvania: *An Entomologist in Costa Rica*.

There was briefly recounted certain physical and meteorological features of that country which render it very favorable for the study of the influence of these factors on the distribution and habits of plants and animals. A few localities, selected from those in which the speaker had worked during the year from May, 1909, to May, 1910, were described and their fruitfulness illustrated by some of the discoveries made of the habits and life histories of the Odonata (dragonflies) obtained therein.

The following officers were elected for the ensuing year:

President—C. J. S. Bethune.
First Vice-president—Philip P. Calvert.
Second Vice-president—W. M. Marshall.
Secretary-Treasurer—Alex. D. MacGillivray.
Additional Members of the Executive Committee
 —Herbert Osborn, C. P. Gillette, V. L. Kellogg,
 J. G. Needham, C. T. Brues and Nathan Banks.
Member of Committee on Nomenclature for
three years—E. P. Felt.

ALEX. D. MACGILLIVRAY,
Secretary

SOCIETIES AND ACADEMIES

THE BOTANICAL SOCIETY OF WASHINGTON

THE eighty-fifth regular meeting of the Botanical Society of Washington was held at the Cosmos Club, Tuesday evening, January 7, 1913.

The following scientific program was presented:
 DR. DAVID GRIFFITHS: *Performances in Species of Opuntia*. (Illustrated with lantern slides.)

This paper will be published in the near future as a bulletin of the Bureau of Plant Industry.

MR. J. B. NORTON: *Some Interesting Facts Concerning the Genus Asparagus*. (Illustrated with lantern slides.)

This paper gave a review of the interesting features connected with the work of breeding a rust-resistant variety of asparagus. *Asparagus officinalis* has never been found to be completely immune to the attacks of its rust, *Puccinia asparagi*. Plants nearly immune to the destructive summer stages show no resistance to the ædial stage of the fungus. Resistance seems to be due to morphological causes. Related species are attacked by the rust, but the members of other sections of the genus seem immune. The genus *Asparagus* and its relatives are entirely limited to the old world, the majority being African. A study is being made of the relationships of this group and many new characters based on the manner of growth, roots, stems, leaf scales, cladodes, etc., have been found. The arrangement of the stomata on the cladodes is very characteristic in the various groups. The old genus *Asparagus* contains several very distinct groups of species entitled to generic rank.

Only one hybrid form of known parentage has been secured, a cross between *A. officinalis* and *A. davuricus*. Many other combinations have failed to produce seed. *Asparagus* grows rapidly—some species average nine inches per day. The seed germination takes from 12 days with *officinalis* to 60 or more days with some African spe-

cies. Several new ornamental forms were described.

C. L. SHEAR,
Corresponding Secretary

THE TORREY BOTANICAL CLUB

THE meeting of November 12, 1912, was held at the American Museum of Natural History. President Burgess presided.

The announced scientific program consisted of an illustrated lecture by Dr. J. J. Levison on "Tree Problems of our City."

THE meeting of November 27, 1912, was held in the laboratory of the New York Botanical Garden. Vice-president Barnhart presided.

The first paper was by Dr. W. A. Murrill, on "The Polypores of the Adirondacks." This paper has been published in full in the *Journal of the New York Botanical Garden*, 13: 174-178, November, 1912.

The second number was given by Dr. A. B. Stout. The subject of his discussion was "The Distribution of Tissues in the Root Tip of *Carex aquatilis*." Several photomicrographs of sections of root tips were exhibited, and drawings were made to illustrate particular features in the arrangement of the tissues.

THE meeting of December 10, 1912, was held at the American Museum of Natural History. President Burgess presided.

On the motion of Dr. Southwick the treasurer was authorized to draw an order for the sum of twenty dollars in favor of Dr. William Mansfield to cover the dues as the representative of the club to the council of the New York Academy of Sciences.

The paper of the evening was on "Diatoms," by Dr. Marshall A. Howe. It was a semi-popular account of the principal structural and morphological features of diatoms, their distribution and habitat, their geological interest and importance, the various economic uses of diatomaceous earths, etc. The talk was illustrated by about seventy-five lantern slides from the collection of the late Charles F. Cox. Many of the photographs shown were made under high powers of magnification and they brought out with much distinctness the secondary markings and other minute structural details of the walls of various types of diatoms.

B. O. DODGE,
Secretary